PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	Docket No: Q84298
Hitoshi KIDOKORO, et al.	
Appln. No.: 10/517,656	Group Art Unit: 1725
Confirmation No.: 1603	Examiner: Heinrich, Samuel M.
Filed: December 13, 2004	

For: LASER MACHINING APPARATUS AND CONTROL METHOD FOR THE APPARATUS

SUBMISSION OF APPEAL BRIEF

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith please find an Appeal Brief. The USPTO is directed and authorized to charge the statutory fee of $500.00 and all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account. A duplicate copy of this paper is attached.

Respectfully submitted,

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Date: May 24, 2007

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APPEAL BRIEF UNDER 37 C.F.R. § 41.37

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Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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I. REAL PARTY IN INTEREST

The real party in interest is MITSUBISHI DENKI KABUSHIKI KAISHA by virtue of an assignment executed by Hitoshi KIDOKORO and Masato MATSUBARA (hereinafter "Appellants") on November 15, 2004 and recorded in the U.S. Patent and Trademark Office on December 13, 2004 at reel 017329 and frame 0922.

II. RELATED APPEALS AND INTERFERENCES

Upon information and belief, there are no other prior or pending appeals, interferences or judicial proceedings known to Appellants' Representative or the Assignee that may be related to, be directly affected by, or have a bearing on the Board's decision in the Appeal.

III. STATUS OF CLAIMS

Claims 1, 3, 5 and 6 are pending and are the basis of this Appeal.

Claims 1, 3, 5 and 6 stand rejected. See Claims Appendix for listing of claims.

IV. STATUS OF AMENDMENTS

Appellants did not amend the claims subsequent to the October 17, 2006 Final Office Action. Accordingly, all amendments, which have been made during prosecution of the present application, have been entered and are reflected in the attached Claims Appendix.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention is directed to a laser machining apparatus and a method for controlling the laser machining apparatus. The features of independent claims 1 and 5 are described herein in reference to non-limiting embodiments of Appellants' specification.

Claim 1 - Claim 1 recites a laser machining apparatus having a control means 1 for outputting command pulse sets 2 according to control parameter settings for controlling laser pulse output power (Fig. 1; pg. 12, lines 4-7 of Application). A thinning-out means 13, into which the command pulse sets 2 are inputted, is provided for switching out a number of pulses thinned from the command pulse sets, according to a pulse width setting of the control parameters (i.e., non-limiting embodiments of Figs. 1 and 3; pg. 13, line 15 to pg. 14, line 7 of Application). An electric power supplying means 3 is provided for generating, in response to command pulse sets 2 outputted from the thinning-out means 13, pulsed electric power supplied to a load (Fig. 1). Finally, a generating means 8 is provided for pumping, to output a laser beam 12, a laser medium with which a discharging space 7 is filled, by means of discharge generated by the pulsed electric power supplied from the electric power supplying means 3 (pg. 13, lines 4-14 of Application).

Claim 5 - Claim 5 recites a control method for a laser machining apparatus that outputs a laser beam 12. The method involves outputting command pulse sets 2 according to control parameter settings (see Fig. 1 for settings) for controlling laser pulse output power, generating, in

response to the command pulse sets 2, pulsed electric power supplied to a load (Fig. 1; pg. 12, liens 4-7; pg. 13, lines 4-14 of Application). The method further recites pumping a laser medium, with which a discharging space 7 is filled, by means of discharge generated by the pulsed electric power, and changing the switching number of an inverter circuit in an electric power supplying means for generating the pulsed electric power, by thinning out the command pulse sets according to a pulse width command of the control parameters (Figs. 1 and 3; pg. 13, line 4 to pg. 14, line 7).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Claims 1, 3 and 5 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over JP 57186378 to Yoshihide in view of JP 405022941, JP 358141689 and JP 407111427.

B. Claim 6 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Yoshihide in view of JP 405022941, JP 358141689, JP 407111427 and JP 403011904.

VII. ARGUMENT

I. Rejections under 35 U.S.C. § 103(a) in view of JP 57186378 to Yoshihide, JP 405022941, JP 358141689 and JP 407111427

The Examiner has rejected claims 1, 3 and 5 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Yoshihide, JP 405022941, JP 358141689 and JP 407111427.

A. Claims 1 and 5

Claim 1 recites a thinning-out means, into which the command pulse sets are inputted, for switching out a number of pulses thinned from the command pulse sets, according to a pulse width setting of the control parameters. Analogous features can be found in the method recitations of claim 5.

Appellants submit that claims 1 and 5 are patentable over the cited references. For example, in Yoshihide, in order to obtain a pulse train whose power is proportional to the laser output power, the pulse train supplied to the electric power source thereof is densely or rarely controlled with the discharging electric power of each pulse being constant (i.e., the number of the command pulse trains per unit time is set in proportion to desired laser output power) (*see* August 3, 2006 Amendment). As represented by Equation 1 of Yoshihide, the number (Y) of pulse trains per unit time is obtained by commanding a ratio (X/Xmax) against the maximum value (Xmax). Accordingly, the number of pulse trains is set based on the *strength of laser output power* (i.e., if the strength of the laser output power is defined, the number of the command pulse trains per unit time is uniquely set).

On the other hand, Appellants note that in the claimed configuration of the thinning-out means, a number of pulse trains are set in response to the *desired output laser pulse width*. Also, in the present

invention, the command pulse trains are thinned out when the output pulse width is set wide (= the laser output duration is set long). That is, the present invention is configured such that the output laser pulse width is set wide (or can be made longer) without the command pulse number being increased. According to this configuration, an effect can be obtained that the range of the laser output power pulse width can be widely extended without increasing the capacity of an electric power source. In other words, by thinning out the command pulses (without increasing the number), the laser pulse width is widened and the laser-output peak power is suppressed. Therefore, the laser pulse width can be controlled without the laser output power exceeding the laser durability of the mirrors that configure the laser resonator. On the other hand, if the laser pulse width is widened, without thinning out the command pulses (by increasing the number), the laser output power increases, and as a result, the power may exceed the laser durability of the mirrors (see page 18, line 17 to page 19, line 8 of Application).

In the October 17, 2006 Final Office Action, the Examiner cites to JP 405022941, JP 358141689 and JP 407111427 to cure the deficient teachings of Yoshihide. The Examiner maintains that the references teach that it is well known to pulse modulate in response to pulse width and to control motor and volume using pulse trains controlled in response to pulse width (pg. 3 of Final Office Action). Further, the Examiner maintains,

> "The use of a power pulse train with a higher frequency than the laser output response frequency is the same as setting the switching cycle to be faster than the time constant of discharge power and laser output, and controlling the overall width of this thinned or proportioned pulse train would have been obvious at the time applicant's invention was made to a person having ordinary skill in the art in order to obtain output control having no dead band." (pg. 3 of Final Office Action)

In regard to the Examiner's comments of the alleged motivation, Appellants notes that Yoshihide already discloses that its invention does not generate a dead band (English Abstract). Therefore, assuming *arguendo* that the prior art discloses the features as maintained by the Examiner, Appellants submit that the result of having output control, with no dead band, does not serve as a proper reason as to why one skilled in the art would have combined the prior art elements in the manner claimed.

Furthermore, JP 405022941 discloses a pulse train that is made to have as its amplitude, a voltage proportional to a converter voltage. Using a low-pass filter, the reference current is obtained. In JP 358141689, a pulse width is modulated in response to a targeted speed. Finally, in JP 407111427, the number of command pulses is thinned out for controlling an output amplitude value. Appellants submit that such disclosure of each reference fails to teach or suggest the claimed operation of a number of command pulses being thinned out based on setting the output pulse width, as recited in claims 1 and 5. Accordingly, JP 405022941, JP 358141689 and JP 407111427 fail to cure the deficient teachings of Yoshihide, and thus, Appellants submit that controlling the overall width of the laser pulse by thinning or proportioning a control pulse train would not have been obvious.

In the attachment to the March 1, 2007 Advisory Action, the Examiner responds to the arguments presented above by stating that JP 57186378 (Yoshihide) describes pulse train control and the secondary references provide further description of well known pulse train control features. The Examiner therefore maintains that the use of such control features, by thinning out or proportioning the pulse train, would have been obvious. In addition to the reasons presented

above, however, Appellants submit that JP 405022941, JP 358141689 and JP 407111427 do not control their own output pulses for the purpose of effecting a change in the pulse output characteristic of an independent unit, as in the present invention. Thus, contrary to the Examiner's assertion, the invention would not have been obvious.

At least based on the foregoing, Appellants submit that claims 1 and 5 are patentable over the cited references.

B. Claim 3

Since claim 3 is dependent upon claim 1, Appellants submit that such claim is patentable at least by virtue of its dependency.

II. Rejection under 35 U.S.C. § 103(a) in view of Yoshihide, JP 405022941, JP 358141689, JP 407111427 and JP 403011904

Since claim 6 is dependent upon claim 1, and JP 403011904 fails to cure the deficient teachings of Yoshihide, JP 405022941, JP 358141689 and JP 407111427, in regard to claim 1, Appellants submit that claim 6 is patentable at least by virtue of its dependency.

Unless a check is submitted herewith for the fee required under 37 C.F.R. §41.37(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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Date: May 24, 2007

CLAIMS APPENDIX

CLAIMS 1, 3, 5 and 6 ON APPEAL:

1. (rejected): Laser machining apparatus comprising:

a control means for outputting command pulse sets according to control parametersettings for controlling laser pulse output power;

a thinning-out means, into which the command pulse sets are inputted, for switching a number of pulses thinned out from the command pulse sets, according to a pulse width setting of the control parameters

an electric power supplying means for generating, in response to command pulse sets outputted from the thinning-out means, pulsed electric power supplied to a load; and

a generating means for pumping, to output a laser beam, a laser medium with which a discharging space is filled, by means of discharge generated by the pulsed electric power supplied from the electric power supplying means.

3. (rejected): Laser machining apparatus as recited in claim 1, wherein a switching period of the inverter circuit is set shorter than both the time constant for the rise/fall of the electric discharging power and the time constant for the fall of the laser output power.

5. (rejected): A control method for laser machining apparatus that outputs a laser beam, the method comprising:

outputting command pulse sets according to control parameter settings for controlling laser pulse output power,

generating, in response to the command pulse sets, pulsed electric power supplied to a load,

pumping a laser medium, with which a discharging space is filled, by means of discharge generated by the pulsed electric power, and

changing the switching number of an inverter circuit in an electric power supplying means for generating the pulsed electric power, by thinning out the command pulse sets according to a pulse width command of the control parameters.

6. (rejected) The laser machining apparatus as recited in claim 1, wherein two or more modes are provided according to the pulse width setting, the control means discriminates which of the modes is selected according to the pulse width setting, and outputs a mode select signal, and thereby the thinning out means outputs pulse signals with a thinning-out number of pulses being switched.

EVIDENCE APPENDIX:

NONE

RELATED PROCEEDINGS APPENDIX

NONE